southward as the Gulf states. The advance of the high area to the west caused the depression to become greatly extended to the southwest over the Ohio valley and the sudden fall of temperature, due to the northwest winds, was attended by heavy rains in the Ohio valley and lake region. As in the preceding area described, this storm passed to the northeast and disappeared after apparently losing the greater portion of its energy.

VII.—On the morning of the 20th an area of high barometer was central in the upper Saint Lawrence valley, and a second high area was approaching from the extreme northwest, while the barometer was relatively low in the Mississippi valley. The high area to the east of this depression disappeared during the afternoon, but by midnight of that date the pressure had increased from two to four-tenths of an inch at stations on the eastern Rocky mountain slope as far south as Texas, the barometer remaining high and above 30.6 in the upper Missouri valley. The extended trough of low barometer was succeeded by a well-defined low-area, central near Milwaukee, Wisconsin, at 11 p. m., of the 20th, attended by rain in the upper lake region, and generally fair weather and cold northwest winds at the stations west of the Mississippi river. During the 21st this storm-centre moved first to the northwest toward Saint Paul, Minnesota, where it was central at 7 a. m., and afterwards to the southward over Iowa and Missouri, causing rain in the northwest and north of the Ohio valley, followed by gradually clearing weather in these sections on the 22d. The westerly and southerly movements of the depression delayed the advance of the cold wave in the northwest, and the frost warnings issued from this office were only verified at stations west of the Mississippi and in Wisconsin on the dates designated in the warning, but the frosts which occurred two days later in the states north of the Ohio river were caused by the cold wave which followed the disappearance of area number vii. Chart v. of this REVIEW shows the limits within which frosts were reported on the dates for which they were predicted. Reports show that these warnings were verified over the greater portion of the section named, and that frosts actually occurred within a few miles of Chicago, Illinois, and thence southward to Memphis, Tennessee.

VII *a*.—During the 19th, while number vii. was developing in the upper lake region, a second low area appeared north of Manitoba. This disturbance apparently moved southeastward until the afternoon report of the 20th, after which it probably formed a part of the low area previously described as vii.

VIII.—This area was central in Iowa on the 23d, being well-defined at the morning report of that date, and attended by local rains in the northwest and lake region. It moved directly eastward during the 23d, causing general rains in all districts, increasing in energy as it passed over the lake region. The barometer fell at stations near the centre, and by midnight of the 24th the centre of the disturbance was north of Lake Ontario, where the pressure was 29.06. This storm became unusually violent as it passed northeastward over the Saint Lawrence valley, and dangerous gales and heavy rains occurred at the Canadian stations, in the lower lake region, and off the New England coast. On the morning of the 25th the centre was near Farther Point, where the barometer had fallen to 28.8. The afternoon report of the same date showed that the centre of disturbance had passed to the east of Farther Point, but the barometer had fallen to 28.71 at this station, with a wind velocity of forty-seven miles per hour from the west. This storm disappeared to the east of the maritime stations on the 26th.

IX.—Low area ix. approached from Colorado on the 28th, where it was central at midnight of that date as a slight disturbance. It moved directly eastward during the 29th and 30th over the Ohio valley, causing but a slight disturbance at the central stations. It was at no time well defined as a low area but as an extended trough of low pressure moving slowly eastward, attended by variable winds and light rains. Cold northerly winds prevailed at the northern stations at the close of the month, and the reports received at 11 p. m. of the 30th indicate that this depression passed off the middle Atlantic coast with increasing energy.

NORTH ATLANTIC STORMS DURING SEPTEMBER, 1883.

[*Pressure expressed in inches and in millimetres; wind-force by scale of* 0—10.]

Chart ii. exhibits the tracks of the principal depressions that have moved over the north Atlantic ocean during September, 1883. The location of the various storm-centres has been approximately determined from reports of observations furnished by agents and captains of ocean steamships and sailing vessels in the north Atlantic, and from other miscellaneous data received at this office up to October 21st. The observations used are, in general, simultaneous, being taken each day at 7 h. 0 m. a. m., Washington, or 0 h. 8 m. p. m., Greenwich mean time.

Five depressions are charted for the month of September, 1883. Of these, two are traced from the coast of the North American continent eastward to Europe; and one is a continuation of a disturbance traced from the United States to mid-ocean at the close of August. The remaining depressions, numbers ii. and v., either dissipated or moved northward beyond the limits of observation. It is more probable, however, that they took the latter course, since scattering vessel-reports at hand indicate the presence of depressions north of the fifty-fifth parallel, passing far to the north of the British Isles. The depressions numbered iii. and iv. appear to have moved somewhat south of the usual track. The violent West India hurricane which prevailed during first decade of the month is traced on chart i., and is fully described in this REVIEW as number iv., under the heading "Areas of low barometer." The following descriptions refer to the depressions traced on chart ii.:

I.—This was a continuation of the tropical hurricane described as number viii. in the REVIEW for August. It moved over the Banks of Newfoundland as a storm of great energy, and at the close of August it was central near N. 52°, W. 35°. Moving eastward, or slightly south of east, with undiminished energy during that day, it reached N. 50°, W. 15°, on the 1st. The following report, furnished by Captain Bussins, of the s. s. "Neckar," is given as indicating the approximate vicinity of the storm-centre and its violence:

Date.	Time.	Position. Lat. N.	Position. Long. W.	Barometer (corrected). Inches.	Barometer (corrected). Mill.	Wind. Direction.	Wind. Force.	Remarks.
		° ′	° ′					
Aug. 31	noon	Off	Lizard	29.75	755.6	ne.	2–3	Almost calm at times.
Do	4 p. m			29.75	755.6	sw.	2	Smooth sea.
Do	8 p. m	49 44	8 00	29.74	755.4	wsw.	2	Light westerly swell.
Do	12 p. m	49 54	9 16	29.70	754.4	w.	3	Wind backing.
Do	16 p. m	50 04	10 32	29.42	747.3	s.	5	Do.
Do	20 p. m	50 23	11 20	29.81	731.8	sc.	9	Rain; heavy showers.
Sept. 1	noon	50 30	12 35	28.43	722.1	ese.	7–6	Rain and confused sea.
Do	1 p. m			28.30	720.3			Lowest reading.
Do	4 p. m	50 30	13 44	28.52	724.4	nne.	8	Rain and confused sea.
Do	8 p. m	50 30	14 13	28.67	728.2	n.	9	Increasing wind and sea. At 6.30 p. m. wind nnw., was blowing a hurricane; ship hove to.
Do	8 p. m	50 29	14 22	28.84	732.5	nnw.		Wind blowing a hurricane; ship hove to.
Do	12 p. m	50 28	14 41	28.98	732.1	nnw.	10	Slightly clearing.
Do	16 p. m	50 27	15 05	29.27	743.4	nnw.	9	Do.
Do	20 p. m	50 27	15 30	29.46	748.3	nnw.	9	Sky breaking.
Sept. 2	noon	50 28	16 10	29.60	751.8	nnw.	8	Sea decreasing; weather moderately fine and the sky cleared.

Captain Heeley, of the s. s. "England," reports as follows: "September 1st, 3 a. m., Greenwich mean time, barometer 28.4 (721.3), light variable winds veering between ese. and nne., with very heavy sw. sea. 5 a. m., barometer 28.37 (720.6), very threatening appearance to the northeastward. 5.30 a. m., gale struck us from nne., rapidly increasing to hurricane force, with very heavy confused sea and heavy rain; ship enveloped in spray and impossible to see a ship's length. Kept ship away to the southward; the barometer began to rise rapidly. 7 a.

m., 28.65 (727.7); 9 a. m., 28.85 (732.8); 11 a. m., 29.15 (740.4). Gale moderating. Rounded ship to, with head to nw.; 1 p. m., strong gale with furious squalls and heavy cross sea; ship laboring heavily; barometer 29.25 (742.9). Midnight, wind and sea moderating; barometer, 29.62 (752.3). The ship's position, at the time the gale struck us, was N. 50° 45′, W. 18° 15′."

The steamers "Westphalia," "Bohemia," "British Crown," "Samaria," and others between N. 50° and 52° and W. 15° and 20°, all reported a barometric pressure of less than 28.4 (721.3), with terrific gales from ssw. to nnw. The gale extended to the English Channel and over the Bay of Biscay, and caused numerous shipping disasters. On the 2d the centre of disturbance moved over the British Isles, causing heavy gales and much damage in those islands, the North sea, and along the coast of northwestern Europe.

II.—This was probably a continuation of the depression charted as low area iii. of chart i. It passed over the Gulf of Saint Lawrence during the 9th, and was central north of the Banks of Newfoundland on the 10th; on the Banks the brig "Marietta" on that day had a heavy gale, and split and lost sails. The disturbance apparently moved northeastward with decreasing pressure, and on the 11th it was near N. 55°, W. 33°.

The s. s. "Polynesian" reported as follows: "September 10th, 8 p. m., Greenwich mean time, wind increasing and sea rising, dirty appearance, barometer 29.81 (757.2), falling rapidly, wind sw. Midnight, barometer 29.35 (745.5), wind increasing to a heavy gale with high cross sea. At 4 a. m. of the 11th, barometer 29.07 (738.4), increasing sse. gale with high dangerous sea from sw.; 6.15 a. m., barometer 28.67 (728.2), wind sw., shifting suddenly to wnw., violent gales with terrific squalls; 8 a. m., gale continues, with hail-squalls and high westerly sea. Noon, (about N. 56° 17′, W. 34° 4′) gale continues with hail-squalls, barometer 29.12 (739.6); midnight, barometer 29.47 (748.5), gale continued until 8 a. m. of the 12th, when it began to moderate, wind w."

During the 11th the disturbance probably passed northward beyond the sixtieth parallel.

III.—This disturbance was first observed on the banks of Newfoundland on the 14th. The s. s. "Lord Gough," in N. 50° 2′, W. 42° 00′, reported barometer 29.69 (754.1), a fall of .13 inch during the preceding twenty-four hours, wind backing to wsw., showery; while the s. s. "Polynesian," to the northwest of the centre, in N. 53° 5′, W. 50° 4′, reported barometer 29.67 (753.6), wind hauling to e., through s., and into ne., gentle. During the day the disturbance moved by a course somewhat south of east, and by the 15th the centre had reached N. 49°, W. 37°, where the barometer read 29.5 (749.3). Moving slowly east-southeastward, the storm-centre was shown near N. 48°, W. 30°, on the 16th. The following reports indicate the proximity of the centre:

Captain Cochrane, of the s. s. "The Queen," reported: "At 2 p. m. of September 15th, the barometer began to fall, with increasing wind from sse., and rain; at 11 p. m., wind hauled to ssw., then backed again to sse., and by 6 a. m. of the 16th, it had backed to se. by e. At 11 a. m., (about N. 49° 30′, W. 29° 50′) it had hauled again to ssw., the barometer falling steadily; by 2 p. m. it had backed to se., and round by e. to ne. at 6 p. m., when the barometer was at its lowest and read (mercurial) 29.12 (739.6), (aneroid) 28.82 (732.0). The wind still backed round till it reached nnw., blowing a fresh gale with a very heavy and confused sea. By midnight of the 17th the wind and sea had moderated very much. As the wind backed to the northward of east, the barometer commenced to rise rapidly."

Captain Willigerod, of the s. s. "Elbe," reported: "On September 16th a depression was observed near N. 50°, W. 29°; fresh gale from se., with thick and misty weather and falling barometer until 9 p. m., when the wind hauled to e. and ne.; lowest barometer, 28.98 (736.1). After that time the wind shifted to nw., fresh gale, rising barometer, and clearing weather. Had high confused sea all the time; ship labored heavily."

Captain Pearce, of the s. s. "Greece" in about N. 48° 40′, W. 25°, reported: "September 16th, 7.15 p. m., (N. 48° 50′, W. 23° 50′) barometer 29.2 (741.7), the wind, which had previously hauled from se. to sse. during the afternoon and moderated from strong to fresh gale, now commenced to blow with increased force. Midnight, heavy gale from w. by s.; barometer, 29.0 (736.6), passing showers of rain. September 17th, 4. a. m., gale continues to blow from w. by s. with decreasing force, barometer rising."

Captain Hellmers, of the s. s. "Habsburg," reported: "16th, in N. 49° 40′, and between W. 26° 50′, and 26° 15′, strong gale from se., which lasted four hours, lowest barometer 29.19 (741.4)."

The s. s. "Dominion," in N. 55°, W. 38°, reported long se. swell running against a northwest wind, cloudy hazy weather. During the 16th the course appears to have changed to the northeastward, and on the 17th the disturbance was shown near N. 51°, W. 27°. The s. s. "Nessmore," in N. 50° 44′, W. 28° 04′, reported barometer 28.82 (732.0), wind w., force 7; and the s. s. "Arizona," in N. 51° 10′, W. 26° 26′, barometer 29.06 (738.1), wind sw., force 6, showery. The storm-centre moved very slowly in an easterly direction; the vessel reports of the 18th and 19th show that s. winds prevailed from W. 25° eastward to W. 15°, while w. and nw. winds prevailed to the west of the first mentioned meridian; the barometer over this region read 29.6 (751.8). By the 20th the disturbance was central north of N. 50°, and near W. 17°. During the day it appears to have passed slightly south of Ireland and over the English Channel.

IV.—This is probably a continuation of the depression charted as vi. of chart i. It passed over the Gulf of Saint Lawrence and the Maritime Provinces during the 17th, and, on the 18th, it was shown on the Banks; vessels in that neighborhood reporting a decrease of pressure amounting to about .15 inch, wind shifting to south. It moved slowly eastward during the 18th and 19th, the pressure gradually decreasing, and, on the 20th, was central near N. 45°, W. 42°; the s. s. "Samaria," in N. 45° 25′, W. 42° 25′, reports barometer 28.95 (735.3), wind e., force 5; and the s. s. "Archimedes," in N. 43° 21′, W. 45° 17′, barometer 29.25 (742.9), wind wnw., force 7–8. Captain Pearce, of the s. s. "Greece," reported, 20th, a. m., wind se., rain; 4.30 a. m., after about four hours rain the wind shifted suddenly from se. to nne. and blew a strong gale, barometer 29.24 (742.7); 8 a. m., strong nne. gale, with rain. At noon the wind backed suddenly to nw., and blew with the force of a heavy gale; 4 p. m., barometer began to rise; 5 p. m., less rain, clouds breaking in the west and gale moderating; the ship's position was N. 44° 27′, W. 43° 45′.

Captain Meyer, of the s. s. "Ohio," furnishes the following report:

Date.	Time.	Barometer (corrected.)		Wind.	
		Inches.	Mill.	Direction.	Force.
September 20	3 a. m.	29.34	745.2	nnw.	6–7
Do	7 a. m.	29.32	744.7	nne.	7
Do	11 a. m.	29.21	741.9	n.	7
Do	3 p. m.	28.74	730.0	nnw.	7–10
Do	4 p. m.	28.74	730.0	nnw.	10–5
Do	7 p. m.	28.90	734.0	ene.	7–6

The wind reached its greatest force at 3 p. m., after which the wind and sea decreased rapidly; ship's position, N. 45° 7′, W. 44° 45′. During the 21st the pressure remained unchanged, and stormy weather continued as the disturbance moved slowly eastward. On the 22d, the storm-centre, having moved northeastward, was shown near N. 49°, W. 32° in which region the barometer read 28.9 (734.0), with n. to nw. winds and rain-squalls. On the 23d the storm-centre was well defined near N. 51°, W. 25°, barometer 28.9 (734.0) with moderate s. gales to the eastward, and w. and nw. gales to the westward of the centre. Continuing its northeasterly movement during the day, the storm-centre reached N. 55°, W. 18°, on the 14th; the

barometer near the centre reading 29.0 (736.0). Strong sw. gales were now reported by vessels between the fiftieth and fifty-third meridian and off the southwest coast of Ireland. On the 25th the depression was northwest of Ireland, and moving northeastward.

V.—This was probably a continuation of low area viii. of chart i. It passed over the maritime provinces of Canada and the gulf of Saint Lawrence as a severe gale on the 25th; and on the following day it was probably central in or near Newfoundland, vessels on the Banks reporting a pressure of 29.6 (751.8), moderate sw. gales. On the 27th the barometric pressure over the ocean between N. 49° and 55° and W. 35° and 40°, was 29.6 (751.8), wind sw.; and on the following day the disturbance disappeared, the pressure over the above-mentioned region having increased to 30.1 (764.5) and above.

OCEAN ICE.

The small number of vessels reporting icebergs in the North Atlantic ice region, indicates that the danger attending vessels bound to and from Europe, through the proximity of icebergs, is now comparatively small; the line showing the limits of icebergs, on chart ii., is therefore discontinued.

The following are the only icebergs reported to have been observed during the month:

The s. s. "State of Indiana," at noon of the 1st, in N. 48° 25′, W. 47° 10′, saw a large iceberg.

The s. s. "Grecian," on the 7th, in N. 53° 23′, W. 49° 20′, passed two icebergs.

The s. s. "Nederland," on the 10th, in N. 49° 01′, W. 44° 33′ passed an iceberg.

The s. s. "Thingvalla," on the 30th, in N. 49° 35′, W. 47° 53′, passed an iceberg one hundred and fifty feet high.

TEMPERATURE OF THE AIR.

[*Expressed in degrees, Fahrenheit.*]

The distribution of mean temperature over the United States and Canada, for the month of September, 1883, is exhibited on chart iii., by the dotted isothermal lines.

In the first column of the following table are shown the normal temperatures of September in the several districts, as determined from the Signal Service records; the second column shows the mean temperature of September, 1883, and the third column shows the departures of September, 1883, from the normal:

Average Temperatures for September, 1883.

Districts.	Average for September, Signal-Service observations.		Comparison of Sept., 1883, with the average for several years.
	For several years.	For 1883.	
	°	°	
New England	62.2	59.8	2.4 below.
Middle Atlantic states	68.2	65.8	2.4 below.
South Atlantic states	74.3	72.8	1.5 below.
Florida peninsula	80.1	79.7	0.4 below.
Eastern Gulf	74.8	75.2	0.4 above.
Western Gulf	76.0	75.4	0.6 below.
Rio Grande valley	80.5	78.8	1.7 below.
Tennessee	70.1	69.7	0.4 below.
Ohio valley	67.7	65.8	1.9 below.
Lower lakes	62.7	58.2	4.5 below.
Upper lakes	59.0	55.3	3.7 below.
Extreme northwest	54.7	53.7	1.0 below.
Upper Mississippi valley	64.8	61.6	3.2 below.
Missouri valley	63.6	60.4	3.2 below.
Northern slope	56.7	56.4	0.3 below.
Middle slope	63.9	63.9	normal.
Northern plateau	59.8	59.8	normal.
Southern plateau	72.2	72.4	0.2 above.
North Pacific	58.9	59.4	0.5 above.
Middle Pacific	68.0	69.7	1.7 above.
South Pacific	72.8	75.8	3.0 above.
Mount Washington, N. H	40.9	38.9	2.0 below.
Pike's Peak, Colo	31.3	30.2	1.1 below.
Salt Lake City, Utah	64.4	69.3	4.9 above.

The mean temperature of September, 1883, has been above the normal in California, Nevada, Utah, and Arizona, and in the eastern Gulf states, the departures being greatest in southern California and at Salt Lake City, Utah, where they are 3° and 4°.9 respectively. In the eastern Gulf states the mean temperature exceeds the normal by only 0°.4, and in the northern plateau, north Pacific coast region, and middle slope it has not differed from the September normal. Over the country east of the Rocky mountains, with the exception of the east Gulf states and middle slope, the mean temperature has been below the normal. The departures are less than 1° in the northern slope, Tennessee, Florida, and in the west Gulf states, while in the upper Mississippi and Missouri valleys, and in the lake region, the departures below the normal temperature have varied from 3°.2 in the two first named districts to 4°.5 in the lower lake region. On the Atlantic coast the mean temperature has averaged from 1°.5 below the normal in the south Atlantic states, to 2°.4 below in the New England and the Middle Atlantic states.

The general distribution of mean temperature, with the districts of maximum departures from the normal, for the month of September in each year from 1873 to 1882, inclusive, are as follows:

Districts.	Maximum departures.	Year.	Remarks.
	°		
Western Gulf	+ 0.6	1873	Normal in New England, the south Atlantic states, Tennessee, and the Ohio valley; slightly above the normal in the lower lake region, middle Atlantic, and Gulf states; below the normal in the upper lake region, Minnesota, and in the upper Mississippi and Missouri valleys.
Middle Atlantic states	+ 0.5		
Minnesota	− 2.5		
Upper Mississippi valley	− 2.0		
Missouri valley	− 1.5		
Upper lakes	+ 5.7	1874	Normal in the south Atlantic states; below the normal in the lower Missouri valley and on the Pacific coast; above the normal in the Southern states and in the northern districts east of the Missouri valley.
Lower lakes	+ 4.7		
Ohio valley and Tennessee	+ 3.1		
Lower Missouri valley	− 2.5		
Pacific coast	− 1.2		
Saint Lawrence valley	− 4.0	1875	Below the normal over the entire country, the departures being least marked in the Missouri valley and on the Pacific coast.
Gulf states	− 2.7		
New England	− 2.5		
South Atlantic states	− 1.8		
South Atlantic states	+ 0.2	1876	Slightly above the normal in the south Atlantic states; normal in the middle Atlantic states; below the normal in all other parts of the country.
Saint Lawrence valley	− 2.0		
Lower Missouri valley	− 1.8		
Lower lakes	− 1.6		
New England	− 1.5		
Upper Missouri valley	+ 5.9	1877	Normal at the Rocky mountain stations; above the normal in all other parts of the country, the departures being least marked on the Pacific coast and in the Ohio valley and Gulf states.
Upper Mississippi valley	+ 4.6		
Upper lakes	+ 4.2		
New England	+ 3.7		
Upper lakes	+ 3.6	1878	Normal in the upper Missouri valley; slightly below the normal on the Pacific coast and in Minnesota; above the normal in all other districts.
Lower lakes	+ 3.2		
Middle Atlantic States	+ 3.2		
Pacific coast	− 0.6		
Minnesota	− 0.2		
Boisé City, Idaho	+ 6.8	1879	Above the normal at the Rocky mountain stations and in the west Gulf states; below the normal in the Rio Grande and Missouri valleys, Minnesota, and in all districts east of the Mississippi river, except normal at the Canadian maritime stations.
Pike's Peak, Colo	+ 5.0		
Northern slope	+ 4.8		
Lower lakes	− 2.9		
Rio Grande valley	− 2.7		
Saint Lawrence valley	− 2.6		
Canadian maritime stations	+ 1.9	1880	Above the normal in the northern plateau, northern slope, middle Atlantic states, and from the lake region to the Canadian Maritime Provinces; below the normal in all other parts of the country.
New England	+ 1.8		
Middle Atlantic states	+ 1.4		
Southern slope	− 2.3		
Western Gulf	− 1.8		
Eastern Gulf	− 1.6		
Lower lakes	+ 8.9	1881	Normal in the Rio Grande valley; below the normal in Minnesota, the Missouri valley, northern slope, and west of the Rocky mountains, except slightly above in southern California; above the normal in all other districts, the departures being exceptionally large in the lower lake region, middle Atlantic states, and Ohio valley.
Middle Atlantic states	+ 8.2		
Ohio valley	+ 7.5		
Northern plateau	− 5.1		
Salt Lake City	− 4.4		
Southern plateau	− 3.5		
Extreme northwest	+ 3.3	1882	Normal in the Ohio valley and south Atlantic states; below the normal on the Pacific coast and over the southern portions of the country; above the normal in the lower Missouri valley and over the northern districts from the Rocky mountains to the Atlantic coast.
Northern plateau	+ 2.2		
Middle Atlantic states	+ 1.6		
Southern slope	− 6.3		
Rio Grande valley	− 3.3		
Southern plateau	− 2.8		

The following are some of the highest and lowest monthly mean temperatures reported from the Signal Service stations during the month: